

Straight TALK

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STEM

Science, Technology, Engineering and Mathematics (STEM) are core education subjects that students should be introduced to at an early age. The acronym was created at an interagency meeting on science education held at the National Science Foundation (NSF) chaired by then NSF Director Rita Colwell. Dr. Colwell was interested in K-12 science and mathematical education and was a proponent of increasing the number of women and minorities in science and engineering. The initial concept was to transform the teaching of math and science by incorporating technology and engineering into an integrated curriculum called STEM.¹ When I was in school, each of these subjects were taught independently, but today's current method of teaching science, engineering and math includes a technology component that provides a way to solve problems and apply what is learned in the classroom.

Unknowingly, I became interested in science, technology, engineering and math when I was very young, because I was curious about the sights and sounds of nature. The resounding noise created by Northern Spring Peepers and Bullfrogs on a rainy spring night, the ripples produced on the surface of a mountain stream from the gentle rise of a Brook Trout to an adult mayfly, the changing colors of the leaves of deciduous trees every autumn and all the other wonders of nature created questions that needed answered by an inquiring mind. I learned the basics during my K-12 years, which helped me understand what I was seeing in my adventures afield. It also caused me to major in biology and minor in chemistry and math in undergraduate school and continue my journey deeper into the sciences in graduate school, where I majored in aquatic biology and minored in environmental engineering. However, I had to personally integrate this knowledge on my own time and in my own way.

Today's students benefit from the structure of STEM, which teaches innovation and allows students to learn about science and math in traditional ways but also apply it to answer many questions that they may have in an organized program.

"Science, technology, engineering and mathematics are an important part of education in a competitive global marketplace. In 2009, the United States educational system received some sobering news. The Program of International Student Assessment (PISA) ranked 15-year-old United States high school students 18th in mathematics and 13th in science. These results were based on data from 34 participating nations. Some of the nations with higher student scores included much smaller and far less wealthy nations like Estonia, Slovenia and Finland. It was apparent that the United States educational system needed significant improvement in these areas if the students who would be the workforce of tomorrow were to have a competitive edge in a globalized, high-tech marketplace"²

The National Academies of Sciences and Engineering reports that the United States ranks 27th among developed nations on the percentage of college graduates who earn a degree in science or engineering. The initial vision for STEM education was to provide a way for today's students to become tomorrow's leaders. If we are to remain competitive in the world's marketplace, we need to close the education gap between our own students and those from other countries.

What role can the Pennsylvania Fish & Boat Commission (PFBC) play as a STEM ambassador? The PFBC has a long history of working with the Pennsylvania Department of Education (PDE) dating back to the 1970s and Earth Day with conservation education. These programs evolved into an environmental education curriculum where we assisted with the drafting of Academic Standards for Environment and Ecology and the state assessment programs. We were a longstanding member of the Environmental Education



photo: Spring Grant

Trout In the Classroom helps foster awareness of coldwater conservation in students in grades 3-12 and encourages participation in coldwater resource projects and recreation programs.

Advisory Council, and our staff continue to work with PDE staff on critical elements of the science element of STEM for fisheries biology and aquatic ecology.

Trout In the Classroom (TIC)

We are excited about new opportunities provided by our TIC program, which is a joint interdisciplinary program that introduces coldwater conservation education in Pennsylvania schools by raising Brook Trout from eggs to fingerlings. It is a partnership between PFBC, PDE, Pennsylvania Council of Trout Unlimited (PATU), local Trout Unlimited chapters, schools and other local partners. Each summer, PFBC provides teachers with curriculum and training. TIC classrooms receive Brook Trout eggs from PFBC's Benner Spring State Fish Hatchery in the fall, and fingerlings are released in April or May. Teachers use curriculum and materials, as well as a 55-gallon aquarium, to teach about fish ecology and management, and the value of protecting, conserving and managing coldwater resources.

The program helps foster awareness of coldwater conservation in students in grades 3–12 and encourages participation in coldwater resource projects and recreation programs. For the 2016-2017 TIC school year, we currently have 313 TIC classrooms, representing 199 school districts across Pennsylvania. Nearly 40 percent of all public school districts in Pennsylvania and more than 35,000 students participated in TIC in 2015–2016. On average, each classroom started with 270 eggs and released 92 fingerlings ranging in size from 2- to 4-inches. In total, teachers received 73,000 viable eggs and released 25,000 fingerling Brook Trout. TIC subjects taught throughout the school year include fish ecology, habitat, watersheds, conservation, fish management and more. In 2015-2016, TIC teachers reported over 10,600 TIC teaching hours.

Wildlife Leadership Academy (WLA)

The mission of the WLA is to engage and empower high school students to become Conservation Ambassadors to ensure a sustained wildlife, fisheries and natural resource legacy for future generations. The PFBC is a proud partner and supporter of WLA for both the PA Brookies Academy and the new PA Bass Academy. Under the leadership and vision of WLA Executive Director Michele Kittell, WLA educates and empowers our next generation of conservation leaders. The impact of the school goes far beyond the one-week boot camp of intense conservation education. Students become trained and passionate Conservation Ambassadors. The information learned in the school travels back home with the student to

family, friends and neighbors who also learn about the value of conservation for Pennsylvania's fish and wildlife resources. To date, 371 graduate students from 62 Pennsylvania counties have reached over 32,000 people across Pennsylvania with their conservation message.

The PFBC fully recognizes the importance of youth education in Science, Technology, Engineering and Mathematics. Our fisheries biologists; engineers; property services, construction and maintenance crews; fish culturists; waterways conservation officers; administrators; licensing and registration staff; lawyers; clerical personnel; surveyors; communication, education and outreach employees; and habitat management workforce chose to pursue a career with PFBC and use their STEM education and experience every day. The continued success of PFBC's conservation and recreation mission depends upon our future generations understanding the importance of STEM education for any career path they choose to follow.

I have a future meeting scheduled with PDE Secretary Pedro A. Rivera and State Representative James R. Roebuck, Minority Chair of the Education Committee, to discuss ways to work together using the STEM curriculum to advance our common goal of ensuring that today's students become tomorrow's conservation leaders, not only in Pennsylvania but across the globe. We plan to discuss some innovative and exciting partnerships that I hope to report on in the future. It promises to be an exciting and prosperous New Year.

Your Director,

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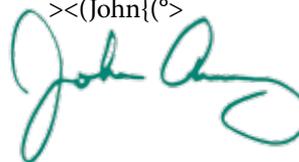


photo-courtesy of Wildlife Leadership Academy



PA Brookies Academy students during a stream study.

¹https://en.wikipedia.org/wiki/Science,_technology,_engineering,_and_mathematics

²<http://www.stemschool.com/articles/what-is-stem-education>



The mission of the Pennsylvania Fish & Boat Commission is to protect, conserve and enhance the Commonwealth's aquatic resources and provide fishing and boating opportunities.

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